downwards from its previous base just below the "*Aulopora*" unit, at the inferred break in sequence (see Webby and Semeniuk, 1971, text-fig. 2) to well within the lower half of the massive, middle part of the Cliefden Caves Limestone. The "*Aulopora*" unit contains *B.? grandis* and *B.?* sp., and the overlying "Island" unit exhibits *B. gracilis* (Hill, 1957) and encrusting forms *Aulopora walliensis* sp. nov., *A.* sp.B and sp.C. The Fauna II elements of the Quondong Limestone (Bowan Park Group) include *B. gracilis* and *A. walliensis*. Forms doubtfully referred to *B. furcata* also occur in the Quondong Limestone and upper part of the Regan's Creek Limestone.

Another species of *Aulopora*, *A.* sp.A occurs in the limestone of the lower part of the Goonumbla Volcanics north of Gunningbland. It is a member of the Fauna III assemblage.

In a limestone breccia towards the base of the Malongulli Formation, overlying the Cliefden Caves Limestone, I. G. Percival found a distinctive species of *Catenipora*, *C.* sp., at a level normally included in Fauna III (Webby, 1969, 1975). The Malongulli species, though derived, must be similar to or older than the enclosing sediments (Zone of *Dicranograptus hians*—late Eastonian) and must represent the earliest appearance of *Catenipora* in the New South Wales succession. The appearance of *Catenipora* is therefore not diagnostic of Fauna IV as previously stated (Webby, 1972).

However, the species *Catenipora clausa* sp. nov., *C.* cf. *obliqua* (Fischer-Benzon, 1871) and *Adaverina acritos* sp. nov., occurring in the limestone band and breccias at the top of the Malachi's Hill Beds (Semeniuk, 1970), represent characteristic components of Fauna IV. Possibly coming from a similar horizon is the occurrence of *Halysites* sp. from the Angullong Tuff of Rodds Creek (Smith, 1966).

Systematic Descriptions

Superfamily LICHENARIIDEA

Family LYOPORIDAE Kiaer 1930

Genus EOFLETCHERIA Bassler 1950

Type species. *Columnaria incerta* Billings 1859.

Diagnosis. Phaceloid to locally cerioid colony of cylindrical, thick-walled corallites. Short, thick septal trabeculae in wall; sometimes project as short spines into lumen. Transverse wrinkles may occur in outer corallite wall. Lateral increase frequent. Tabulae irregularly spaced, usually complete, horizontal or sagging. No pores and no connecting processes.

Discussion. Although originally described by Bassler (1950, p. 266) as lacking septal structures, later workers (Hill, 1953, 1955; Sokolov, 1962; Klaamann, 1966) have widened the scope of the genus to include species with septal trabeculae. Hill and Stumm (1956), on the other hand, have since stated in their diagnosis of *Eofletcheria* that there are no septa and that the corallites are connected by "short, horizontal syringoporoid tubules". The type species, *E. incerta* from the Chazyan of Mingan Islands, Montreal and Ottawa, as descibed by Okulitch (1937) and Sinclair (1961) has, however, no connecting processes or tubules between individual corallites. Lambe's (1899) interpretation of septal spines in the type species has not been substantiated by later workers, but other species of *Eofletcheria*, notably *E. orvikui* (Sokolov, 1951), exhibit such structures. The species assigned to the genus are listed by Klaamann (1966). To this list should be added one Australian species, *E. hadra* sp. nov., described herein.

Sokolov (1955, 1962) and Klaamann (1965, 1966) have assigned *Eofletcheria* and *Reuschia* Kiaer 1930 to the Family Lyoporidae Kiaer 1930 (Subfamily

Eofletcherinae Sokolov 1955), whereas Hill (1953), despite emphasising resemblances in the character of the transverse wrinklings of corallite wall of *Eofletcheria*, *Reuschia* and cerioid *Lyopora*, preferred to relate the first two genera to syringoporids and auloporids—Subfamily Syringoporinae of the Family Auloporidae (Hill and Stumm, 1956).

Eofletcheria hadra sp. nov.

Pl. V, figs 1–5 ; Pl. VI, fig. 4.

Material. Holotype SUP 78185 and paratypes SUP 78223, 78184 from the " mixed fauna " unit west of Boonderoo shearing shed. Other paratypes from the " mixed fauna " unit comprise SUP 78218 from east of Fossil Hill and SUP 78180 from south-west of Fossil Hill. A fifth paratype (SUP 78163) comes from the " lower coral " unit at Fossil Hill. All types are from the lower part of the Cliefden Caves Limestone.

Description. Corallum of moderately closely spaced corallites ranging from fasciculate to cerioid in habit (not ramose) ; one colony (Pl. V, fig. 5) encrusts *Tetradium cribriforme* (Etheridge). Adult corallites usually range from 2·1 to 3·3 mm in diameter, but colonies exhibiting a predominantly cerioid form tend to have smaller corallites, usually from 1·7 to 2·5 mm in diameter. In transverse sections, corallites show rounded to polygonal and alveolitoid outlines ; wall of variable thickness, usually from 0·3 to 0·7 mm, but in extremes, especially in cerioid forms, up to 0·9 mm thick, and almost entirely fills interior of corallite. Dark median line is exhibited where corallites are in contact. Wall to either side of dark line composed of radially aligned fibrous, possibly trabecular, tissue. A few rare examples mainly where a thinner wall is represented show spine-like projections of trabeculae into lumen (Pl. V, fig. 3), but usually inner margin of wall is smooth. In parts of corallum conspicuous transverse wrinkles develop in outer corallite walls (Pl. V, fig. 1 ; Pl. VI, fig. 4) ; only rarely does entire wall become folded causing an overall widening of the lumen (Pl. V, fig. 1). Calices may be very deep (Pl. VI, fig. 4). Rejuvenescence is suggested by occasional rapid constrictions in diameter of an individual corallite. Increase is apparently of lateral type. Tabulae typically flat or sagging ; rarely updomed ; display extreme variability of vertical spacing, from closely spaced intervals (eight in 3 mm) in some corallites to apparent absence from others.

Remarks. The specimen described by Hill (1955) as *Lyopora* cf. *favosa* (McCoy) from the Gordon Limestone at Oceana Mine, Zeehan, Tasmania, may belong to this species or be closely related. Both the type species *E. incerta* and *E. subparallela* Hill 1953 from the Mjøsa Limestone of Norway, like *E. hadra*, exhibit transverse wrinkling. However, *E. incerta* has much smaller corallite diameters and thinner walls, and *E. subparallela* has more wide spaced corallites with a more variable diameter.

Family CRYPTOLICHENARIIDAE Sokolov, *in* Sokolov and Mironova, 1959

Genus BAJGOLIA Dziubo 1962

Type species. Bajgolia altaica Dziubo 1962.

Diagnosis. Ramose colony with cylindrical to slightly compressed branches. Corallites with polygonal shapes axially, curving up and outward as rounded and thickened tubes to open obliquely at the surface of the branch ; usually with moderately wide interspaces between individual calices. Wall of radially aligned fibrous (trabecular ?) tissue ; presence of septal trabeculae not proven. Unequal, adaxial, bipartite parricidal increase. Tabulae rare or absent ;

irregularly spaced and usually complete; horizontal, sagging or updomed forms. No pores or connecting processes.

Discussion. The type species of *Bajgolia*, *B. altaica* Dziubo 1962, from the late Ordovician of the Altai Mountains, south-west Siberia, is based only on the holotype. Dziubo's original diagnosis states that tabulae are absent. The New South Wales representatives, in contrast, usually exhibit rare tabulae, although not every specimen of a particular species shows them. It seems likely that Dziubo's failure to observe tabulae in the type species is a reflection of inadequate sampling or study, and that there is no fundamental difference between the apparently non-tabulated type species from Siberia and the tabulated Australian forms.

The Australian species formerly assigned by Hill (1955, 1957) to the genus *Eofletcheria*, by having a ramose colony form and by exhibiting unequal, adaxial, bipartite increase, are now included in the genus *Bajgolia*. They differ fundamentally in growth form and mode of increase from the type species and other North American and Eurasian species of *Eofletcheria*. The genus *Bajgolia* seems to have a restricted distribution to the late Ordovician of south-west Siberia, New South Wales and Tasmania.

Bajgolia is placed by Dziubo (1962, 1965) and by the present writer in the Family Cryptolichenariidae because it exhibits a similar pattern of adaxial, bipartite increase to other representatives of the family, notably *Cryptolichenaria* Sokolov 1955, *Amsassia* Sokolov and Mironova 1959 and *Porkunites* Klaamann 1966. However the first two of these genera show massive, cerioid coralla, unlike the ramose form of *Bajgolia*, while *Porkunites* has a much more open fasciculate habit.

Sokolov and Mironova (1959), Sokolov (1962) and Klaamann (1966) allied the genera *Cryptolichenaria*, *Amsassia* and *Porkunites* to the tetradiids because of the type of axial increase. However, there is a fundamental difference between the tetradiids which exhibit quadripartite increase and those genera of the Family Cryptolichenariidae which show bipartite increase. Representatives of this family, while showing features which are essentially intermediate between *Lichenaria* and *Tetradium*, seem more satisfactorily grouped with *Lichenaria*. The markedly different growth form and type of preservation of *Bajgolia* do not ally it at all closely to *Tetradium*. Alternatively, based on morphological similarities, but not on the mode of increase, *Bajgolia* may be aligned with auloporids.

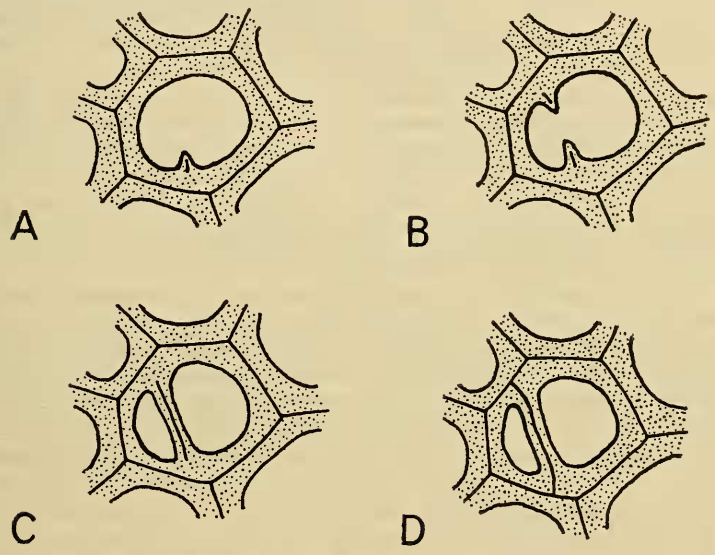
Bajgolia caespitosa sp. nov.

Pl. II, figs 1–7

Material. Holotype (SUP 78179) from the " mixed fauna " unit east of Fossil Hill; three paratypes (SUP 78181, 78183, 78186) from the " mixed fauna " unit west of the Boonderoo shearing shed, and a fourth (SUP 78191) from the " lower coral " unit at Licking Hole Creek. The " lower coral " and " mixed fauna " units are in the lower part of the Cliefden Caves Limestone.

Description. Ramose corallum composed of branches of variable thickness usually from 5 to 8 mm across. Corallites of axis of branch usually polygonal, often seen in process of bipartite division. Corallites curve upwards and outwards away from axial region, opening obliquely to surface; may exhibit free outer ends. Corallites in distal parts of branch usually cylindrical and from 1·4 to 1·7 (although in extremes up to 2·0) mm in diameter. Wall thickness varies from 0·1 to 0·7 (on average from 0·25 to 0·40) mm; thickening in rare instances almost entirely fills lumen; towards distal extremities there is a marked thinning of wall. Sclerenchyme with fibrosity aligned at right angles to median dark

line ; also associated concentric fracture pattern, probably of secondary origin. Division is unequal, adaxial, bipartite and parricidal. New wall commences to grow from small protuberances of sclerenchyme either on one side or both sides of lumen (Pl. II, figs 6–7 ; Text-fig. 1A-D) ; protuberances extend inwards as septa-like structures to fuse axially and so subdivide the lumen into unequal divisions. Dark median line establishes in new dividing wall between two " daughters " but does not initially extend to join dark line surrounding former " mother " corallite (Text-fig. 1C). This is because with a moderately deep calice the intervening sclerenchyme had already been formed by " mother " polyp immediately prior to division. With further growth, dark line dividing " daughters " extends outwards to fuse with that surrounding former " mother " corallite (Text-fig. 1D). No evidence of dimorhpism or corallite offsets (Oliver, 1966). Rare flat to sagging tabulae.



Text-fig. 1. Series of diagrammatic transverse sections showing nature of unequal, adaxial increase in *Bajgolia* (based on *B. caespitosa* ; approximately ×11). A. Initial inward extension of sclerenchyme from one side of lumen only ; sometimes this single protrusion extends right across lumen and is not met halfway by matching plate-like " septa " from opposite side. B–D. Stages in the development and fusion of the " septal " structures extending from both sides of the lumen to form a new dividing wall with two adjacent new " daughter " corallites.

Remarks. One very large ramose colony (SUP 78190) in the collections of the Department of Geology and Geophysics, University of Sydney, bears close morphological similarities to *B. caespitosa.* However, unfortunately the specimen has lost its attached locality and horizon data. It seems likely from manner of preservation and appearance to have been collected from the lower part of the Cliefden Caves Limestone, but this cannot be established with certainty. The colony has an overall flattened hemispherical form, with a flattened top surface and a weakly cone-shaped bottom ; it has dimensions of 480 by 440 mm across and 140 mm in height. Branches radiate outwards and upwards from a centre placed slightly eccentrically at the bottom of the cone. The branches reach a vertical height of 140 mm directly above the centre of growth, but extend outwards a much greater distance, in some instances for some 300 mm from the original growth centre. Corallite dimensions are very similar to those of *B. caespitosa.* However, the colony has on average much thinner corallite walls (Pl. II, fig. 8).

Bajgolia furcata sp. nov.

Pl. II, fig. 9 ; Pl. IV, figs 1, 4–6.

Material. Holotype (SUP 78155) and paratypes (SUP 78151–54, 78156, 78159–60, 78175) from the " lower coral " unit at Fossil Hill ; lower part of the Cliefden Caves Limestone.

Description. Moderately sized corallum with discrete branches from 3 to 12 (usually from 4 to 7) mm in diameter ; sometimes seen to be branching off a reptant base of attachment (Pl. IV, fig. 1) or otherwise intergrown with bryozoans. Corallites rounded to polygonal ; in peripheral part of branch mainly cylindrical and at distal ends may be free ; range from 1·0 to 1·8 (usually from 1·2 to 1·5) mm in diameter. Towards axial part of branch corallites tend to be more typically polygonal and include on average smaller dimensions, to a minimum of 0·4 mm in diameter ; some of these smaller corallites occur in areas of active division. Wall of individual corallites mainly from 0·1 to 0·2 mm in thickness ; in extremes may be up to 0·4 mm thick. In transmitted light common wall is composed of a narrow median dark zone from 0·01 to 0·02 mm wide and thick, light-coloured sclerenchyme to either side. Median dark zone frequently appears to consist of two dark lines separated by a narrow grey zone between. Sclerenchyme adjacent to dark zone shows a radial fibrosity but towards inner margin of wall microstructure is obscured by concentric fracture pattern, probably of secondary origin. Division is of an unequal adaxial, bipartite, parricidal type, as in *B. caespitosa* sp. nov. Tabulae, though rarely seen, are of sagging or slightly updomed types.

Remarks. Bajgolia furcata bears resemblances to *B. caespitosa*, but differs in having somewhat smaller corallite dimensions and a lesser thickness of corallite wall. A silicified specimen (SUP 26281) from the Quondong Limestone (Bowan Park Group) at Quondong bears close similarities to the species and perhaps should be assigned to it. The branch fragment of the colony is from 3·5 to 6 mm across, and the corallites have a diameter of from 1·3 to 1·5 mm. The corallites open obliquely at widely spaced intervals along the outer surface of the branch as in *B. gracilis* (Hill, 1957). Another silicified specimen from the upper part of the Regan's Creek Limestone (unit 3 of McLean, 1974) displays a thicker branch (up to 9 mm across) and has a much more closely packed arrangement of corallites (Pl. III, fig. 12). In some parts of the corallum the corallites debouch at right angles to the branch axis. Corallites are mainly from 1·3 to 1·5 mm wide, and wall is from 0·2 to 0·4 mm thick. This form is only doubtfully assigned to the species.

Two unsilicified specimens (SUP 78220–21) of *Bajgolia* from the lower part of the Reedy Creek Limestone just north of Molong may also be allied to *B. furcata*. They are not well preserved but exhibit a slightly different growth form with less discrete bundles or branches and a greater frequency of free, upwardly directed corallites (Pl. VI, fig. 3).

Bajgolia furcata, though resembling *B. contigua* (Hill, 1955) from the Gordon Limestone of the Oceana Mine, Zeehan, Tasmania, and the type species, *B. altaica* Dziubo 1962, from the late Ordovician of south-west Siberia, differs in having on average larger corallite dimensions. It may also be distinguished from *B. altaica*, which has no tabulae.

Bajgolia cf. *contigua* (Hill 1955)

Pl. IV, figs 2–3

Material. Two specimens (SUP 78176–77) from the upper part of the " lower coral " unit at Fossil Hill, and one specimen (SUP 78192) from the " lower coral " unit at Licking Hole Creek ; lower part of the Cliefden Caves Limestone.

Description. Corallum ramose, with branches from 2 to 8 mm in diameter; occasionally intergrown with bryozoans (Pl. IV, fig. 3). Corallites cylindrical in outer parts of individual branches, usually from 0·8 to 1·2 mm in diameter. Inner part of branch has prismatic-shaped corallites, usually of smaller dimensions and frequently undergoing unequal adaxial, bipartite division. Wall thickness varies from 0·07 to 0·15 mm, although in extremes up to 0·25 mm thick. Poor differentiation of wall structure, although median dark line most conspicuous. Domed, flat or gently sagging tabulae occur in some corallites; very rarely seen to be closely spaced (Pl. IV, fig. 2).

Remarks. This New South Wales species appears to be closely similar morphologically to *B. contigua* (Hill, 1955) from the Gordon Limestone of Oceana Mine, Zeehan, except for having a slightly thinner corallite wall and in places more closely spaced tabulae. *Bajgolia altaica* Dziubo 1962 differs in having larger branch dimensions and in lacking tabulae.

Bajgolia minor sp. nov.

Pl. IV, figs 8–9

Material. Holotype (SUP 78164) and paratypes (SUP 78165–66) from the "lower coral" unit of the lower part of the Cliefden Caves Limestone at Fossil Hill.

Description. Small, ramose corallum, typically intimately intergrown with a bryozoan. Branches may form clusters of up to 20 corallites in close contact, or develop with more loosely aggregated bryozoan-supported corallites. Adult corallites range from 0·4 to 0·5 mm in diameter. Wall thickness mainly varies from 0·025 to 0·1 mm. Fibrous sclerenchyme is represented in common wall adjacent to median dark line and at right angles to it; very rarely irregular inner margin of wall may be interpreted as suggesting presence of short spine-like elements. Bipartite adaxial increase at intervals of from 1 to 2 mm along length of corallite, as seen in one branch (Pl. IV, fig. 8). Occasional gently updomed, flat or sagging tabulae observed in a few corallites, spaced from 0·1 to 0·3 mm apart.

Remarks. Although exhibiting a similar ramose growth habit to other species of *Bajgolia*, *B. minor* is the finest and most slender species known. It is nearest to *B. gracilis* (Hill, 1975) from the Quondong Limestone of the Bowan Park Group, but has finer and thinner-walled corallites.

Bajgolia gracilis (Hill, 1975)

Pl. III, figs 1–11; Pl. IV, fig. 7.

1957. *Eofletcheria gracilis* Hill, p. 105, pl. 4, figs 17*b*, 22*b*.

Material. Holotype (University of Queensland Collection, F 23253) from Bowan Park (Por.289, Par. Bowan, Co. Ashburnham). Partially silicified specimen (SUP 78217) from Davys Plains Limestone ("pisolite" unit) Member of Daylesford Limestone, and completely silicified specimens (SUP 78280–90) from the Quondong Limestone of the Bowan Park Group at Quondong (probably the same locality and horizon as the holotype), and from the upper part of the Regan's Creek Limestone (SUP 28154–55). Numerous additional unnumbered specimens come from the Quondong Limestone, and the "Island" unit of the upper part of the Cliefden Caves Limestone at Licking Hole Creek.

Description. Ramose colony with branches varying from cylindrical to markedly compressed (almost flabellate); occasionally encrusted by bryozoans of more than one kind. Corallites are small and polygonal axially, wheras they assume larger more rounded forms towards periphery of the branches. Corallite dimensions usually from 0·5 to 0·8 mm, and wall thickness from 0·1 to 0·2 mm.

Corallites exposed to exterior frequently show well marked fine transverse growth lines (Pl. III, figs 2, 5–6). Division of adaxial, parricidal bipartite (also rarely tripartite) type ; in some parts of branch division seems to be most frequent (Pl. III, figs 9–10), in others much less frequent (Pl. III, fig. 11). Tabulae rarely seen.

Remarks. The present description is based on the abundant silicified material available in the collections of the Department of Geology and Geophysics, University of Sydney, and is intended to supplement the description previously given by Hill (1957).

A silicified specimen (SUP 78292) of *Bajgolia* from the Manooka Limestone Member (*Ischadites* unit) of the Daylesford Formation (Bowan Park Group) exhibits close resemblances to *B. gracilis*. However, the branch of the colony is only about 1·5–2·5 mm wide, and the corallites, usually from 0·7 to 0·9 mm in diameter, open obliquely at rather wider spaced intervals along the length of the branch. The specimen is only doubtfully assigned to the species.

Bajgolia? *grandis* sp. nov.

Pl. VI, figs 1–2 ; Pl. VII, figs 11–12

Material. Holotype (SUP 66154) from the "*Aulopora*" unit of the upper part of the Cliefden Caves Limestone at Licking Hole Creek. The paratypes are silicified. Paratypes SUP 28205–06 are from the "E-horizon" of the middle part of the Cliefden Caves Limestone at Licking Hole Creek, SUP 78291 is from the "Island" unit of the upper part of the Cliefden Caves Limestone at Licking Hole Creek, and SUP 26284 is from the Quondong Limestone (Bowan Park Group) at Quondong.

Description. Large, loosely aggregated, ramose corallum with individual branches varying from about 7 to 23 mm in diameter. Corallites mainly cylindrical and thick-walled, usually from 2·1 to 2·7 mm in diameter. Wall of variable thickness, ranging from 0·2 to 0·9 (typically from 0·4 to 0·5) mm in thickness. External surface of silicified corallites show transverse growth lines. Adaxial, bipartite, parricidal increase (Pl. VI, fig. 1) ; also suggestions of lateral offsets seen in some silicified specimens. Tabulae rare ; flat to gently sagging.

Remarks. The species is doubtfully assigned to the genus *Bajgolia* for the reason that some specimens show what seems to be lateral offsets, and the branches are not formed of the usual tightly aggregated bundles of corallites. Compared with *B.*? *ida* (Hill, 1955) from the Gordon Limestone of Ida Bay, Tasmania, it has larger branches and larger corallite dimensions.

Another specimen (Pl. V, 8–9) from the "*Aulopora*" unit at Licking Hole Creek seems to be allied to *B.*? *grandis*. It has fewer, more loosely clustered corallites in its branches and a greater predominance of free corallites. It has variable corallite dimensions usually from 1·8 to 3·0 mm, but in areas of active increase, corallite diameters from 1·0 to 1·8 mm are not uncommon (Pl. V, fig. 9). Wall in extremes up to 1·2 mm thick. Uneven bipartite division. Rare flat to sagging tabulae.

Bajgolia? sp.

Pl. V, figs 6–7 ; Pl. VI, fig. 7.

Material. Two specimens (SUP 78194, 78196) from the "*Aulopora*" unit of the Cliefden Caves Limestone at Licking Hole Creek.

Description. Dendroid colony composed of loosely interconnected branches and associated free corallites. Corallites usually from 2·7 to 3·5 mm wide.

Corallite wall owing to silicification shows little original structure ; up to 1·2 mm thick. Uneven bipartite adaxial division. No tabulae.

Superfamily AULOPORIDEA

Family AULOPORIDAE Milne Edwards and Haime 1851

Genus AULOPORA Goldfuss 1829

Type species. *Aulopora serpens* Goldfuss 1829

Aulopora walliensis sp. nov.

Pl. VIII, figs 1–7.

Material. Holotype (SUP 78293) from the " Island " unit, upper part of the Cliefden Caves Limestone at Licking Hole Creek, and paratypes from the Quondong Limestone (Bowan Park Group) at Paling Yards Creek (SUP 78294) and Quondong (SUP 77273–75, 78295). Other paratypes (SUP 77271–72) from same locality and horizon as the holotype. All material is silicified.

Derivation of name. Walli, a few kms south of the Cliefden Caves Limestone outcrop at Licking Hole Creek.

Description. Reptant colony, attached to either valve of brachiopod *Trigrammaria* in a type of commensal relationship. Corallites rim anterior to postero-lateral margin of valve and show prominent transverse growth lines or wrinkles (Pl. VIII, figs 4, 6), sometimes secondarily thickened (Pl. VIII, fig. 2). Usually two, or less commonly three, four or more rows of cylindrical to alveolitoid corallites encrust margin of valve. Deep calices. Lateral offsets usually occur at frequent intervals along margin ; less common in early growth stages inside the margin. Notable change in character of growth in holotype (Pl. VIII, fig. 2) presumably due to early growth extending across concave protected part of external surface, while later growth on more exposed and abraded outer margin was much thickened. Adult corallites mainly from 1·6 to 2·2 mm in diameter but in extremes may reach 2·4 mm across. Corallite wall from 0·2 to 0·4 mm across. No tabulae or septal structures seen.

Remarks. The nature of the transverse wrinkles on the outer wall of *A. walliensis* might imply a relationship with the problematical cone-like group, the cornulitids, possibly the compound representative *Conchicolites* Nicholson (see Fisher, 1962). However, tabulate coral genera such as *Eofletcheria* and *Lyopora* also exhibit such wrinkling of the epitheca. Bassler (1950, p. 266) has previously noted the similarity of wall corrugation in cornulitids and *Eofletcheria.* Indeed, it seems likely that some, if not all, the so-called " gregarious commensal " cornulitids (Richards, 1974) are tabulate corals.

Aulopora sp. A

Pl. VI, figs 5–6.

Material. One specimen (SUP 78225) from limestone in the lower part of the Goonumbla Volcanics, Currajong Park, just north of Gunningbland.

Description. Corallum reptant at base ; attached to colony of *Heliolites* although actual contact mainly disrupted by pressure solution with stylolite being formed. Corallites have upward turning, horn-shaped form ; in contact proximally ; mainly free upwards ; attain diameters of from 1·6 to 2·9 mm well above reptant base ; wall of corallites also thickens noticeably to from 0·6 to 0·7 mm. Very deep calice. Tiny, discrete septal spines in stereozone, rarely extending into lumen ; embedded in lamellar sclerenchyme of peripheral stereozone. Individual corallites along reptant base are interconnected ; may represent connecting tubules or corallites actively undergoing fission. No tabulae seen.

Aulopora sp. B

Pl. VIII, figs 10–13

Material. Silicified specimens (SUP 78296–98) encrusting brachiopods *Eodinobolus*? and *Sowerbyites* from the " Island " unit of the upper Chefden Caves Limestone at Licking Hole Creek.

Description. Corallum reptant at base; above base corallites turn upward and become inclined to near vertical tubes. Corallites from 1·3 to 1·7 mm in diameter. Wall from 0·2 to 0·5 mm in thickness; microstructure destroyed by silicification. Calice very deep. No tabulae or septal structures seen. Epitheca smooth to faintly transversely undulating. Lateral offsets only seen to occur on reptant base.

Remarks. Another silicified specimen (Pl. VII, figs 13–15) encrusting the antero-lateral margin of the brachial valve of a *Sowerbyella* is also comparable with *Aulopora* sp. B, but has a more irregular growth habit. Corallites are from 1·5 to 1·9 mm in diameter, and the wall thickness is from 0·2 to 0·3 mm. Calices are deep, and epitheca exhibits weak, transverse growth lines.

Aulopora sp. C

Pl. VIII, figs 8–9

Material. Silicified specimen (SUP 78291) encrusting the brachiopod *Holtedahlina* from the " Island " unit, upper part of the Cliefden Caves Limestone at Licking Hole Creek.

Description. Small, reptant colony which encrusts external surface of brachial valve of *Holtedahlina*. Radiates outwards to lateral margin and covers gap in two valves, suggesting that the encrustation took place after death of the brachiopod. Corallites from 1·0 to 1·2 mm in diameter; wall thickness from 0·2 to 0·3 mm. Lateral offsets common. No septal structures or tabulae seen.

Family AULOCYSTIDAE Sokolov 1950

Genus ADAVERINA Klaamann 1969

Type species. *Syringocystis adaverensis* Klaamann 1966.

Adaverina acritos sp. nov.

Pl. IX, figs 1–8

Material. Holotype (SUP 78214) from the limestone unit at the top of the Malachi's Hill Beds, north-east of Malachi's Hill.

Description. Corallum phaceloid; specimen of holotype measuring 90 mm across and 110 mm high. Corallites slender, cylindrical, usually not in contact except at points of division; range from about 1·3 to 2·0 (on average from 1·5 to 1·7) mm in diameter. Calice deep, with variable U-shaped to acutely funnel-shaped form. Septa represented by tiny holacanthine? spines set in vertical and horizontal series and embedded in lamellar sclerenchyme of the peripheral stereozone; more than 20 septa in an average corallite; either confined to the stereozone or extend a short distance in from it; stereozone varies in thickness from 0·1 to 0·4 (on average from 0·2 to 0·3) mm thick. Increase is of lateral, non-parricidal type—not off the outer wall but arising from peripheral part of parent corallite. No connecting tubules seen.

Tabulae syringoporoid and most variable along the length of individual corallites; in addition to complete sagging, flat and domed plates, there are commonly inclined complete and incomplete infundibuliform plates, some being extremely large elements which extend considerable distances vertically,

and are in places parallel to side walls ; a few smaller elements on side walls resemble dissepiments ; an axially or slightly eccentric placed syrinx is sometimes developed but tends to be discontinuous along the length of the corallite. Septal spines are not seen to occur on tabulae.

Remarks. Klaamann's (1966) species of *Adaverina*, *A. adaverensis* and *A. acclinis* from the Upper Llandovery of Estonia, are not closely similar to *A. acritos*. The New South Wales species has much smaller corallite diameters, more conspicuou slateral budding and a more disordered arrangement of tabulae. But for the lack of connecting tubules, *A. acritos* would seem to be assignable to the genus *Syringopora* Goldfuss.

The type of lateral, non-parricidal increase (Oliver, 1968) differs from lateral increase off the outer wall of the " mother " corallite (see examples of lateral increase in *Hillophyllum* sp., Webby, 1971, fig. 6A-C, H-J). It has been referred to previously as peripheral non-parricidal " budding " (see *Palaeophyllum macrocaule* Webby, 1972, Pl. IX, figs 6, 8). Perhaps a distinction should be drawn between outer lateral and inside lateral types of increase.

Superfamily AULOPORIIDEA ?

Family FLETCHERIIDAE Zittel 1876

Genus FLETCHERIA Milne Edwards and Haime 1851

Type species. *Fletcheria tubifera* Milne Edwards and Haime, 1851.

Fletcheria ? stipulosa sp. nov.

Pl. VII, figs 1–10 ; Pl. IX, figs 9–10

Material. Numerous silicified specimens from the Gerybong Limestone Member (" gastropod " unit) of the Daylesford Limestone (lower part of the Bowan Park Group—Semeniuk, 1972) near Quondong ; usually associated with *Tetradium tenue* Webby and Semeniuk. Holotype is SUP 78215 ; others (SUP 26289–92, 41801, 41804, 78216, 78270–79, 78299) designated paratypes.

Description. Corallum dendroid ; composed of long wavy corallites usually separated except at points of quadripartite division and where connected in series to form discontinuous chains ; up to ten corallites linked in such chains. Calice moderately deep and usually with flat floor. Corallites mainly from 2·7 to 4·0 mm in diameter ; occasionally they reach diameter of up to 4·8 mm just prior to division, and may be down to 2·0 mm immediately after division ; corallites have rounded outline away from areas of active division, and near points of division tend to be subquadrate. Increase is of the parricidal, adaxial, equal quadripartite kind. No septal structures apart from dividing walls, which appear at intervals just prior to division. Thickness of corallite wall varies from 0·15 to 0·35 mm. Horizontal growth lines seen on outer wall of some well preserved specimens. Tabulae usually preserved as complete horizontal elements spaced on average from four to six in 5 mm.

Remarks. Sokolov (1955) in reviewing the literature relating to *Fletcheria* Milne Edwards and Haime 1851 (type species, *F. tubifera*, from the Silurian of Gotland) concluded that the genus had come to be recognised as including a number of widely divergent forms—representatives of several different tabulate coral families and even rugosans. The genus has more recently been restricted to representatives of the Family Fletcheriidae exhibiting peripheral (or " calicular ") type increase, usually with four offsets, thin intermittent laminar-type septa and horizontal tabulae (Sokolov, 1955, 1962). Specimens of the type species, *F. tubifera*, have been observed by Stasińska (1967) as lacking septal spines and showing " intracalycal " increase with five offsets. Duncan (1956) has also indicated that increase the in type species is characteristically not

quadripartite. *Fletcheria quadrifida* Leleshus 1972 from the Silurian of Tadzkikstan, which exhibits rows of septal spines rather than laminar-type septa, should perhaps be excluded from the genus.

Fletcheria? stipulosa has previously been interpreted as a " coral resembling *Pycnostylus* " (Semeniuk, 1970) and as a large *Tetradium syringoporoides*-type of coral, up to 3·5 mm in corallite diameter, with closely spaced tabulae and quadripartite division at widely spaced intervals—possibly a new tetradiid genus (Webby and Semeniuk, 1971, p. 247). Although it is tentatively assigned to the auloporids, following Sokolov (1962), the occurrence of axial increase involving extension of four laminar-type " septa " (more properly dividing walls) suggests a relationship with tetradiids. Assignment of the species to *Fletcheria* is not entirely satisfactory, in the light of Stasińska's and Duncan's observations that the type species, *F. tubifera*, exhibits increase which is characteristically not quadripartite. However, it does not seem justified until *Fletcheria* and its allies are more adequately revised to introduce a new tetradiid genus to accommodate the species, especially as it is mainly based on silicified material.

Nor can the species be satisfactorily assigned to the rugosan genus *Pycnostylus* Whiteaves since it only exhibits four tetradiid-type dividing walls rather than the more normal numerous short " laminar " septa (see Hill, 1940).

The New South Wales species seems to bear the closest similarities to *Fletcheria deadwoodensis* Norford 1962 from the Silurian Sandpile Group of British Columbia, but differs in exhibiting on average slightly larger corallites, more widely spaced tabulae, and in showing a tendency for the colony to adopt a chain-like character.

Superfamily HALYSITOIDEA

Family HALYSITIDAE Milne Edwards and Haime 1850

Genus CATENIPORA Lamarck 1816

Type species. *Cateniporae scharoides* Lamarck 1816.

Catenipora cf. *obliqua* (Fischer-Benzon 1871)

Pl. X, fig. 4

Material. Two specimens (SUP 29103, 27214) from the limestone breccia at the top of the Malachi's Hill Beds, north-east of Malachi's Hill.

Description. Corallum reaches a size of at least 120 mm across ; usually forms loose meshwork of open meandering chains with moderately frequent T-shaped junctions. Up to ten corallites in an individual rank. Calice of variable depth, in extremes up to 1·9 mm deep. Corallites oval in cross section mainly from about 1·7 to 1·9 mm in length and from 1·1 to 1·4 mm in width. Offsets usually issue from mid wall of a corallite rather than between adjacent corallites. Walls mainly from 0·2 to 0·3 mm thick. Septal spines short, in places just protrude inward beyond thickened wall ; form in horizontal and vertical rows (probably 12). " Balken " structure may occur in intercorallite wall (Pl. X, fig. 4). Tabulae thin, normally complete, horizontal to slightly sagging, from 12 to 14 in 5 mm.

Remarks. The New South Wales species is closely related to *Catenipora obliqua* (Fischer-Benzon, 1871) from the late Ordovician (Nabala, Vormsi and Pirgu stages) of Estonia (Klaamann, 1966). However the sinuous ranks of the New South Wales form are not seen to link together to form large lacunae as in the Estonian species.

Catenipora clausa sp. nov.

Pl. X, figs 1, 2, 5

Material. Holotype SUP 75224 ; another specimen (SUP 78222) designated a paratype. Limestone breccia at the top of the Malachi's Hill Beds, north-east of Malachi's Hill.

Description. Corallum with frequent T-junctions and sometimes forming lacunae, a few being as small as 2·2–2·5 mm in longest dimensions (Pl. X, fig. 2); composed of moderately closely spaced meshwork of sinuous chains. Holotype measures approximately 65 by 40 mm across and 75 mm high; associated with *Grewingkia* sp. Up to 11 corallites in an individual rank. Offsets usually from midwall of a corallite, but rarely may also occur between adjacent corallites (Pl. X, fig. 1). Calice 1·5 mm deep. Corallites oval in cross section, typically from 1·5 to 1·9 mm in length and from 1·2 to 1·5 mm in width. Walls are usually rather thick, from 0·30 to 0·45 mm. Septal spines rarely seen to protrude beyond much thickened wall. " Balken " structure may be seen in intercorallite wall. Tabulae are thin, usually complete, flat to gently sagging; in holotype from 14 to 20 in 5 mm. However paratype exhibits much more spaced widely tabulae, typically from 8 to 12 in 5 mm.

Remarks. Catenipora clausa differs from *C.* cf. *obliqua* in having small lacunae, and in having a thicker corallite wall.

Catenipora sp.

Pl. X, figs 6–7

Material. One specimen (SUP 78207) found recently by I. G. Percival from a limestone breccia towards the base of the Malongulli Formation at the " Kurrajongs " in the Licking Hole Creek area, near Walli.

Description. The moderately large silicified specimen exhibits closed, usually elongated meshes ranging from a minimum diameter of 3 to 9 mm to a maximum diameter of at least 25 mm. Corallites have a length of from 1·3 to 1·5 mm and a width of from 1·0 to 1·2 mm. Wall thickness is from 0·15 to 0·25 mm. Vertical rows of tiny septal spines may be seen in silicified interiors of the wall, and give a denticulate appearance to the inner wall of the corallites, as seen in transverse section. Tabulae are characteristically domed (less commonly flat), complete, with a vertical spacing of from 10 to 12 in 5 mm; very rarely seen to occur as incomplete elements.

Remarks. This distinctive species perhaps has closest resemblances to *C. wrighti* Klaamann, 1965, but this European late Ordovician species has mainly horizontal tabulae (Klaamann, 1965, 1966).

Genus HALYSITES Fischer von Waldheim 1813

Type species. Tubipora catenularia Linnaeus 1767.

Halysites sp.

Pl. X, figs 8–9

Material. Four specimens (SUP 78208–09, 78211, 78252) from limestone lens in the Angullong Tuff at Rodds Creek (Locality CO. 1/50 of Smith, 1966, pp. 245, 261).

Description. Mainly small fragmentary specimens with variable form. Some with small lacunae from 1 to 6 mm, others with more widely spaced lacunae, and a few apparently open chains. Ranks with moderately common T-junctions and offsets issuing from off the side wall of individual corallites. Both corallites and tubules well differentiated. Corallites have oval-shaped cross section mainly from 1·4 to 1·8 mm in length and from 1·0 to 1·2 mm in width. Tubules have quadrate outline, and are from 0·3 to 0·5 mm across. Wall is from 0·1 to 0·2 mm thick. Tubulae mainly horizontal; in corallites spaced from 10 to 13 in 5 mm, whereas in tubules from three to five per mm.

Remarks. This species is markedly different from *H. praecedens* Webby and Semeniuk from the upper part of the Clearview Limestone Member of the

Ballingoole Limestone (Bowan Park Group), exhibiting definite lacunae with more frequent branching of chains, and more closely spaced tabulae.

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EXPLANATION OF PLATES

Plate II

Figs 1–7. *Bajgolia caespitosa* sp. nov., lower part of Cliefden Caves Limestone. 1–2. Transverse-oblique sections from " lower coral " unit at Licking Hole Creek, SUP 78191, ×4. 3. Longitudinal section of holotype from " mixed fauna " unit east of Fossil Hill, SUP 78179, ×4. 4. Longitudinal section from " mixed fauna " unit west of Boonderoo shearing shed, SUP 78183, ×4. 5. Transverse section of holotype from " mixed fauna " unit east of Fossil Hill, SUP 78179, ×7. 6–7. Transverse sections of SUP 78181 from " mixed fauna " unit west of Boonderoo shearing shed, showing details of bipartite division, ×7.

Fig. 8. *Bajgolia* cf. *caespitosa* sp. nov., transverse-oblique section of part of large colony probably from lower part of Cliefden Caves Limestone (precise locality and horizon not known), SUP 78190, ×4.

Fig. 9. *Bajgolia furcata* sp. nov., transverse-oblique section of branch of colony from " lower rcoal " unit, lower part of Cliefden Caves Limestone, Fossil Hill ; holotype, SUP 78155, ×4.

Plate III

Figs 1–11. *Bajgolia gracilis* (Hill, 1957), silicified specimens from Quondong Limestone (Bowan Park Group), Quondong, ×3. 1. Lateral view of exterior of branch, SUP 78282. 2. Lateral view of incomplete branch, SUP 78281. Note fine transverse growth lines on external surface. 3–4. Views of lateral and top surfaces of branching colony, SUP 78286. 5–7. Exterior views of two sides and top of flabellate branching colony, SUP 78280. Note fine transverse growth lines on exterior. 8–9. Oblique lateral view of exterior, and longitudinal view of interior of colony, SUP 78283. Note bipartite division in Fig. 9. 10. View of interior of branch showing bipartite division, SUP 78287. 11. View of interior of branch fragment exhibiting few divisions, SUP 78284.

Fig. 12. *Bajgolia furcata*? sp. nov., external view of part of branch ; SUP 28153 from upper part of Regan's Creek Limestone, ×3.

Plate IV

Figs 1, 4–6. *Bajgolia furcata* sp. nov., from " lower coral " unit, lower part of Cliefden Caves Limestone, Fossil Hill. 1. Colony arising off a reptant base of attachment with a bryozoan, SUP 78154, ×4. 4. Transverse-oblique section of SUP 78151, ×4. 5. Longitudinal section of holotype, SUP 78155, ×4. 6. Transverse section of SUP 78152, ×7. Note individual corallites in process of bipartite division.

Figs 2–3. *Bajgolia* cf. *contigua* (Hill, 1955). Longitudinal-oblique and transverse-oblique sections of SUP 78177 from " lower coral " unit, lower part of Cliefden Caves Limestone, ×4. Note bryozoan intergrowth.

Fig. 7. *Bajgolia gracilis* (Hill, 1957) longitudinal-oblique section of partially silicified branch from Davys Plains Limestone Member, Daylesford Limestone (Bowan Park Group), SUP 78217, ×4.

Figs 8–9. *Bajgolia minor* sp. nov., longitudinal and oblique sections of holotype SUP 78164 from " lower coral " unit, lower part of Cliefden Caves Limestone, Fossil Hill, ×4. Note intimate intergrowth association with bryozoan.

Plate V

Figs 1–5. *Eofletcheria hadra* sp. nov., from lower part of Cliefden Caves Limestone. 1–4. From the " mixed fauna " unit west of Boonderoo shearing shed. 1. Longitudinal section showing paratype SUP 78223, and in bottom right corner part of holotype SUP 78185, ×4. 2–3. Holotype, SUP 78185. 2. Transverse section, ×4. 3. Transverse section showing detail of wall with radially aligned fibrous tissue, ×7. 4. Transverse section of paratype SUP 78184, ×4. 5. Longitudinal section showing encrustation of colony on *Tetradium cribriforme* (Etheridge), SUP 78163, ×4, from " lower coral " unit, Fossil Hill.

Figs 6–7. *Bajgolia*? sp. from " *Aulopora* " unit, upper part of Cliefden Caves Limestone, Licking Hole Creek. 6. Transverse section of SUP 78194, ×4. 7. Longitudinal section of SUP 78196, ×4.

Figs 8–9. *Bajgolia*? aff. *grandis* sp. nov., from " *Aulopora* " unit, upper part of Cliefden Caves Limestone, Licking Hole Creek. 8. Longitudinal-oblique section of SUP 78195, ×4, 9. Transverse section of SUP 78195, ×4.

Plate VI

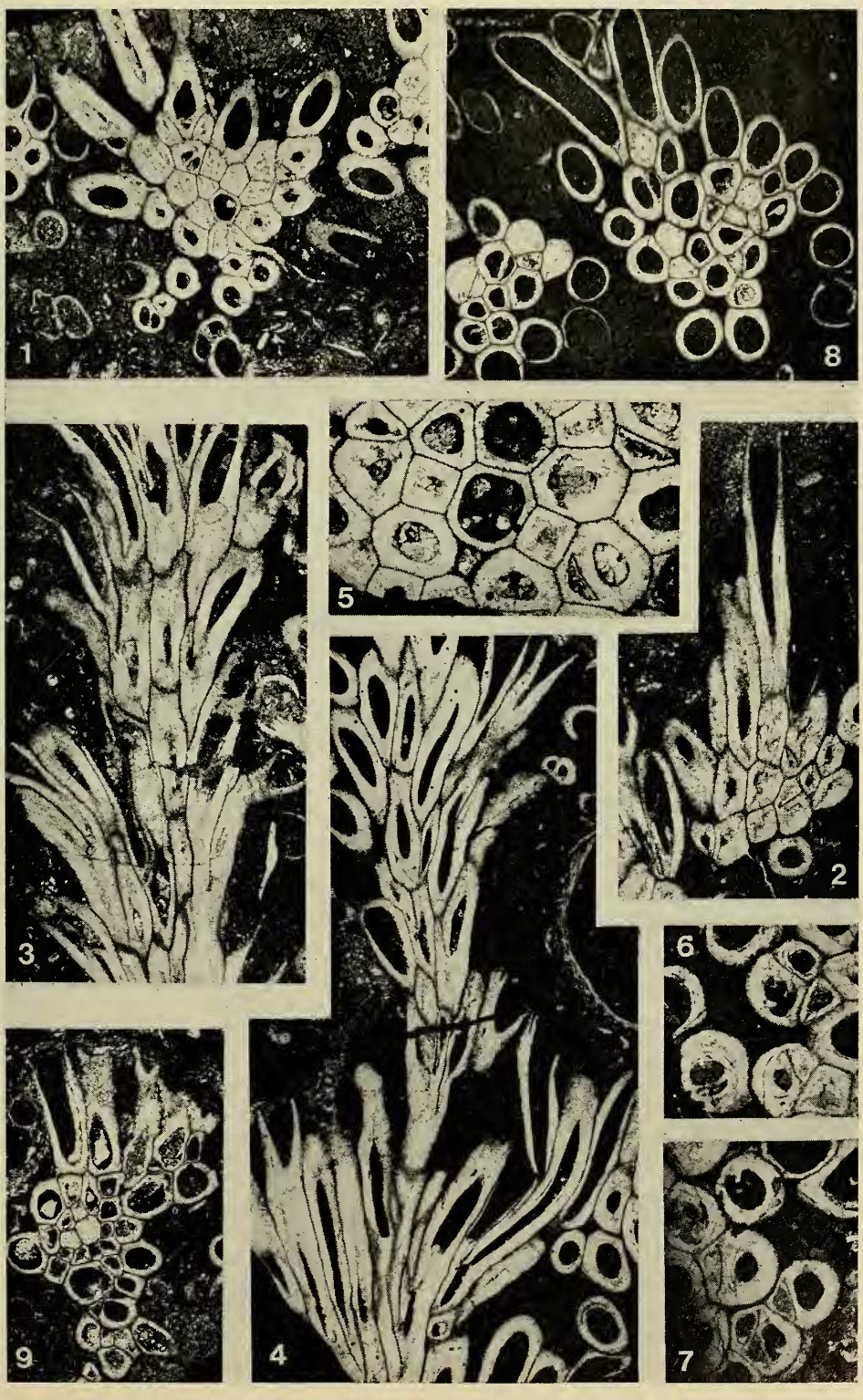
Figs 1–2. *Bajgolia*? *grandis* sp. nov., ×4. Longitudinal section of holotype, SUP 66154, from " *Aulopora* " unit, upper part of Cliefden Caves Limestone, Licking Hole Creek. 2. Transverse section of paratype, SUP 78205, from " E-horizon ", middle part of Cliefden Caves Limestone, Licking Hole Creek.

Fig. 3. *Bajgolia* cf. *furcata* sp. nov., longitudinal section of SUP 78220 from lower part of Reedy Creek Limestone, north of Molong, ×4.

Fig. 4. *Eofletcheria hadra* sp. nov., longitudinal section of paratype SUP 78223 from " mixed fauna " unit, lower part of Cliefden Caves Limestone, west of Boonderoo shearing shed, ×4.

Figs 5–6. *Aulopora* sp. A, ×4. SUP 78225 from limestone, lower part of Goonumbla Volcanics, Currajong Park near Gunningbland. 5. Upturning corallites from a reptant base. 6. Section of colony approximately at right angles to that shown in Fig. 5.

Fig. 7. *Bajgolia*? sp., transverse-oblique section from " *Aulopora* " unit, upper part of Cliefden Caves Limestone, Licking Hole Creek, SUP 78196, ×4.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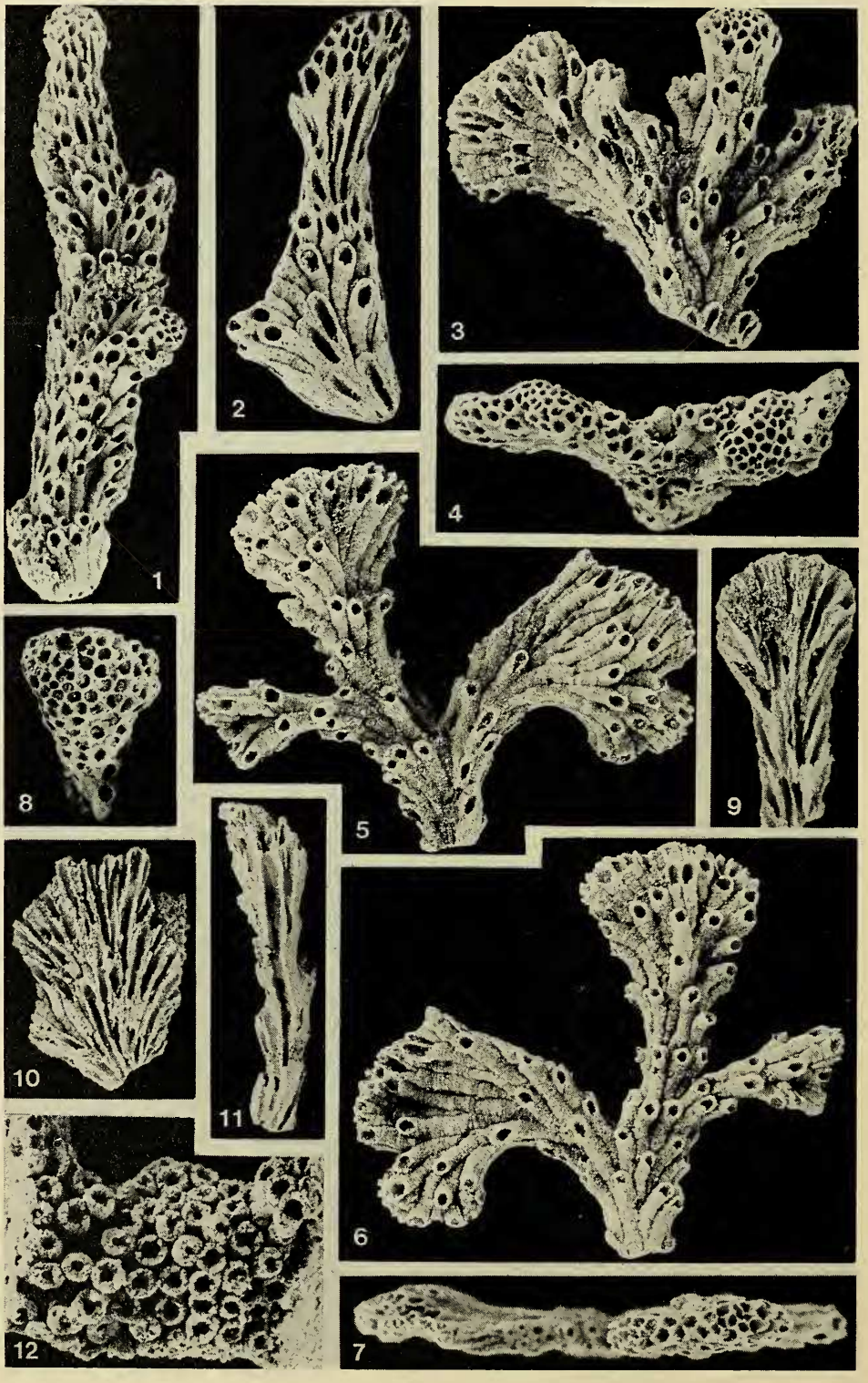
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